Detection of Nitrous Acid (HONO) with an inlet-less Broadband Cavity Enhanced Absorption Spectrometer (BBCEAS)

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An instrument for measuring nitrous acid (HONO), a short-lived reactive trace component of the atmosphere was developed using Broadband Cavity Enhanced Absorption Spectroscopy (BBCEAS). Light is bounced back between two highly reflective mirrors to achieve very long path lengths (2-5 km) over a short (0.5-2m) base length. The path length enhancement enables sensitive detection of trace compounds at the pptv and ppbv level depending on the compound. HONO absorbs strongly in the near UV (350-400 nm) with a structured absorbance pattern allowing for the application of Differential Optical Absorption Spectroscopy (DOAS) fitting to retrieve the concentrations of narrow band absorbers. Measurement of HONO also suffers from contamination and line loss due to the reactivity of the HONO with surfaces. The prototype instrument developed and tested operates without an air sampling inlet, in an “open path” configuration. The instrument also is able to measure other compounds that absorb between 355 and 390 nm such as formaldehyde, BrO, NO2, and O4. Initial instrument performance and field deployment is assessed along with feasibility for eddy-flux measurements.